

The circumsource environment in AGNs

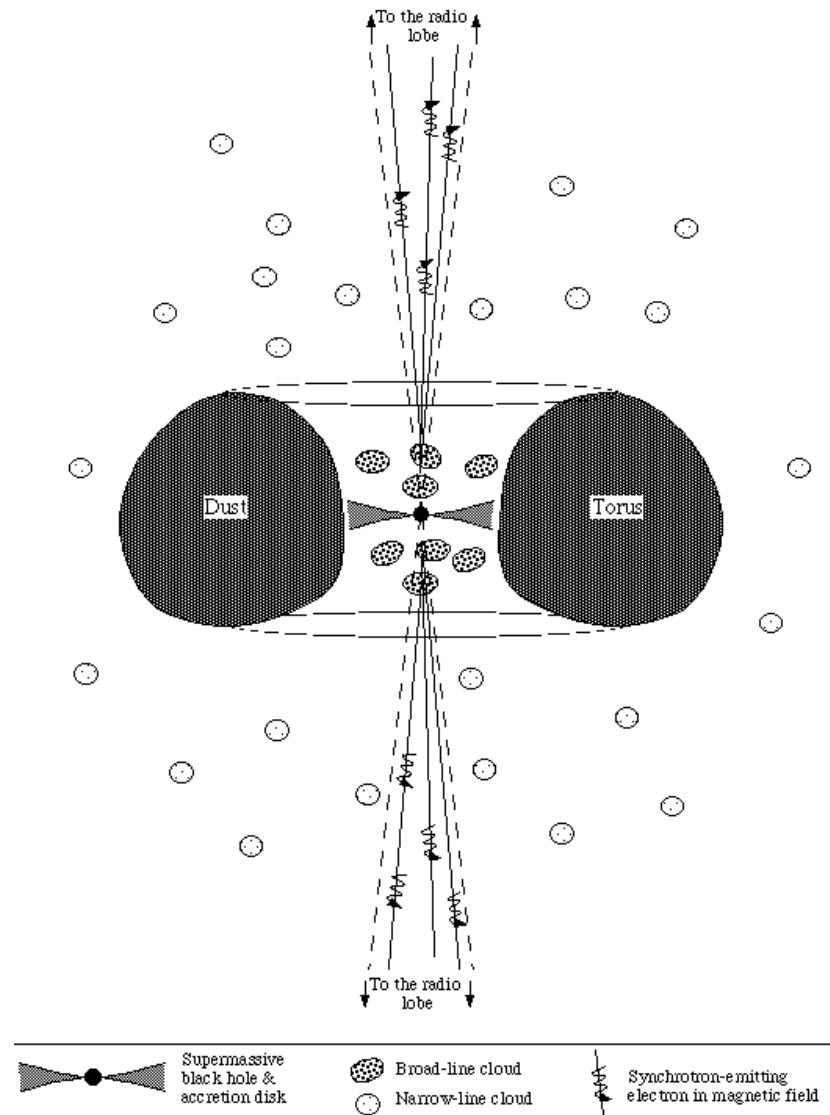
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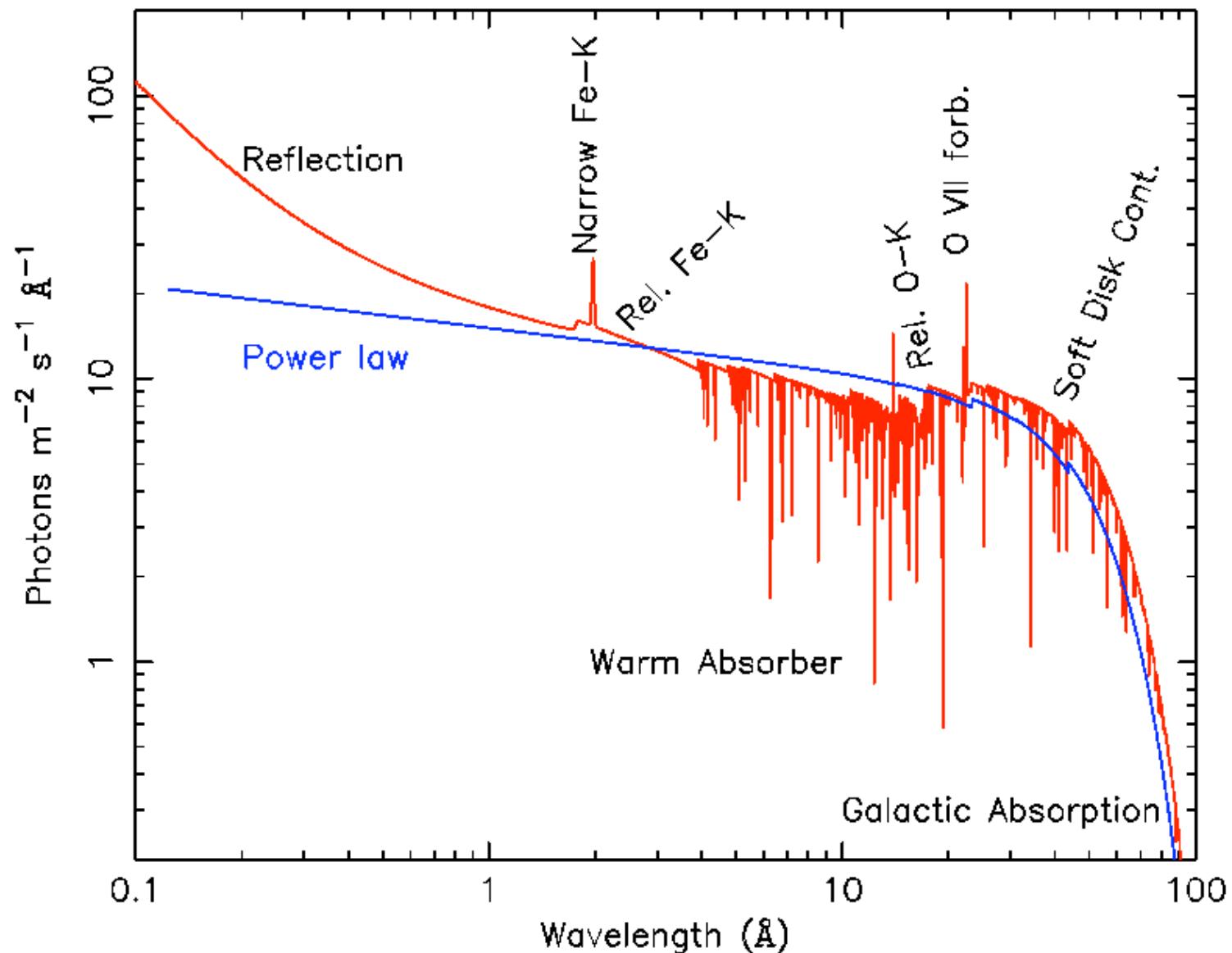
Thanks to: Rob van der Meer, Katrien Steenbrugge
and others

The AGN paradigm

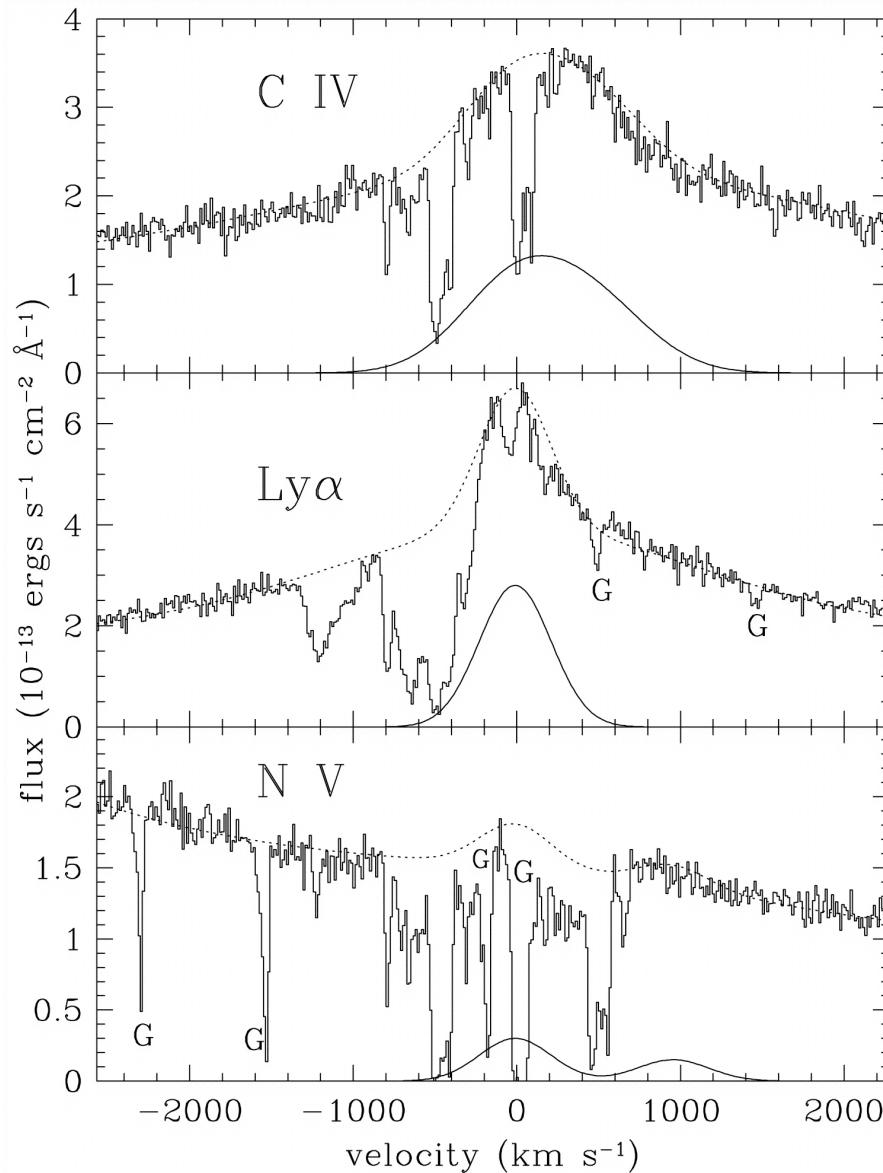
The Active Galaxy Paradigm



Model spectra

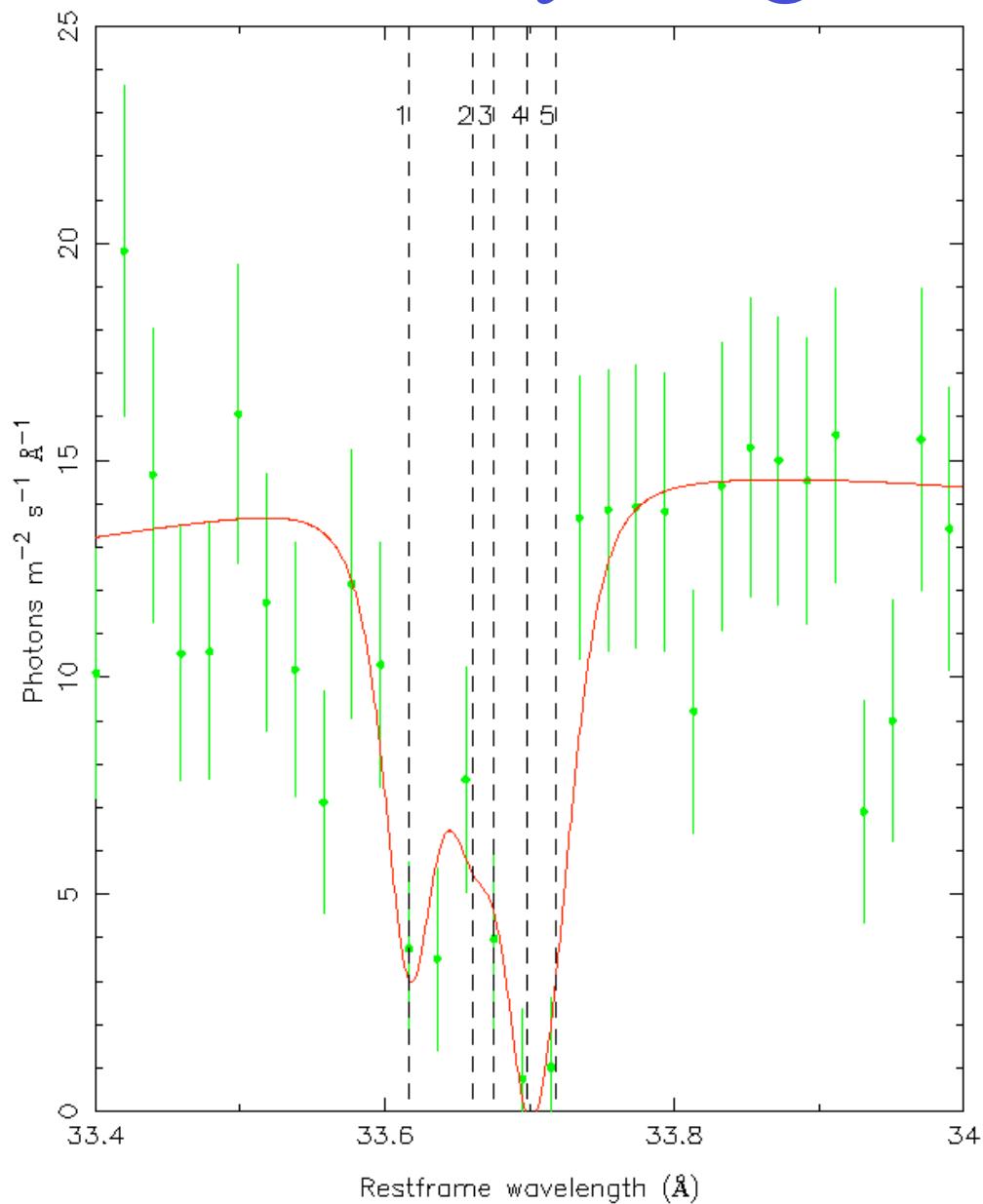


Velocity diagnostics: UV



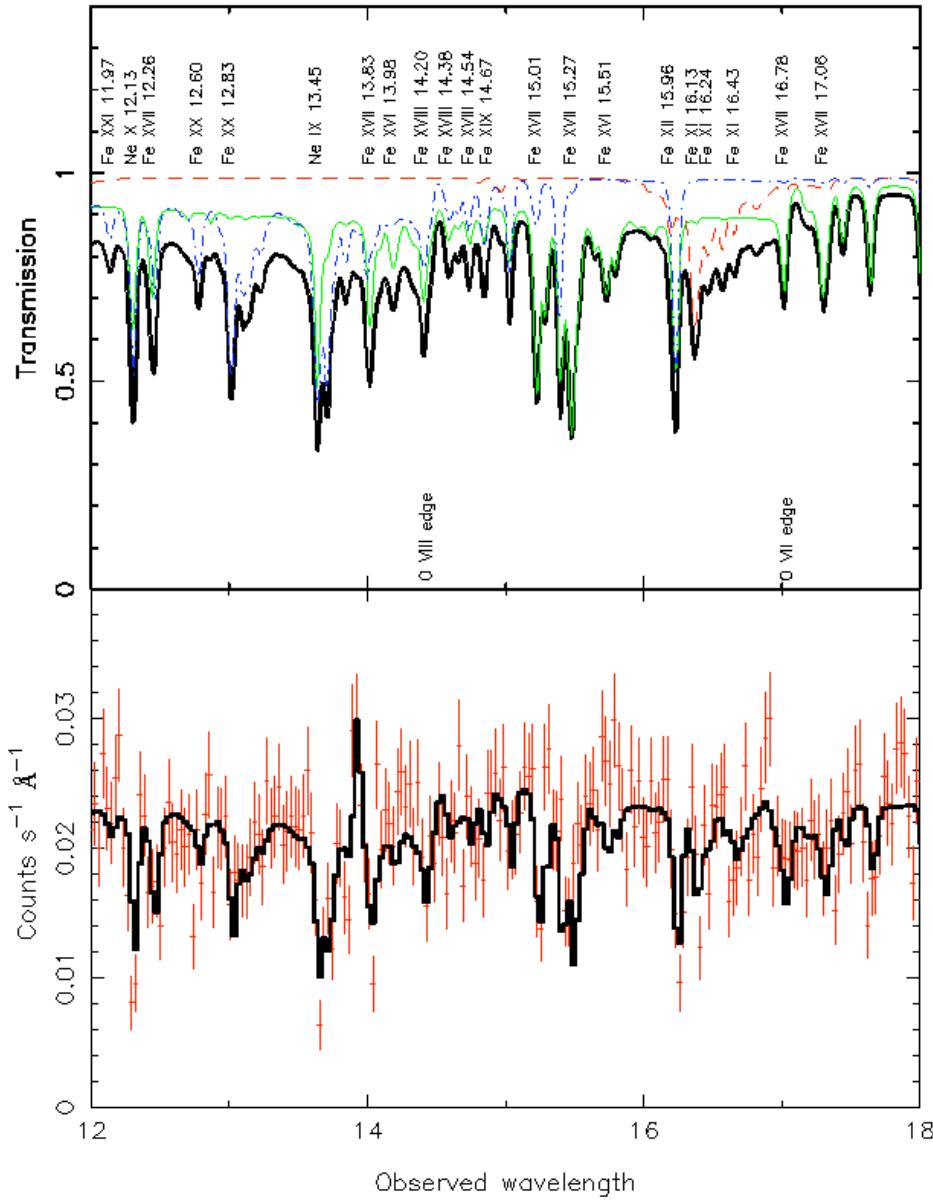
- NGC 5548, STIS,
Arav et al. 2002
- details depend upon
modeling of emission
lines:
- both broad and narrow

Velocity diagnostics: X-ray



- NGC 5548, LETGS,
Kaastra et al. 2002
- poorer resolution than
in UV
- but more ions

Complex ionization structure



Fits to LETGS data
NGC 5548 require at
least 3 ionization
components:

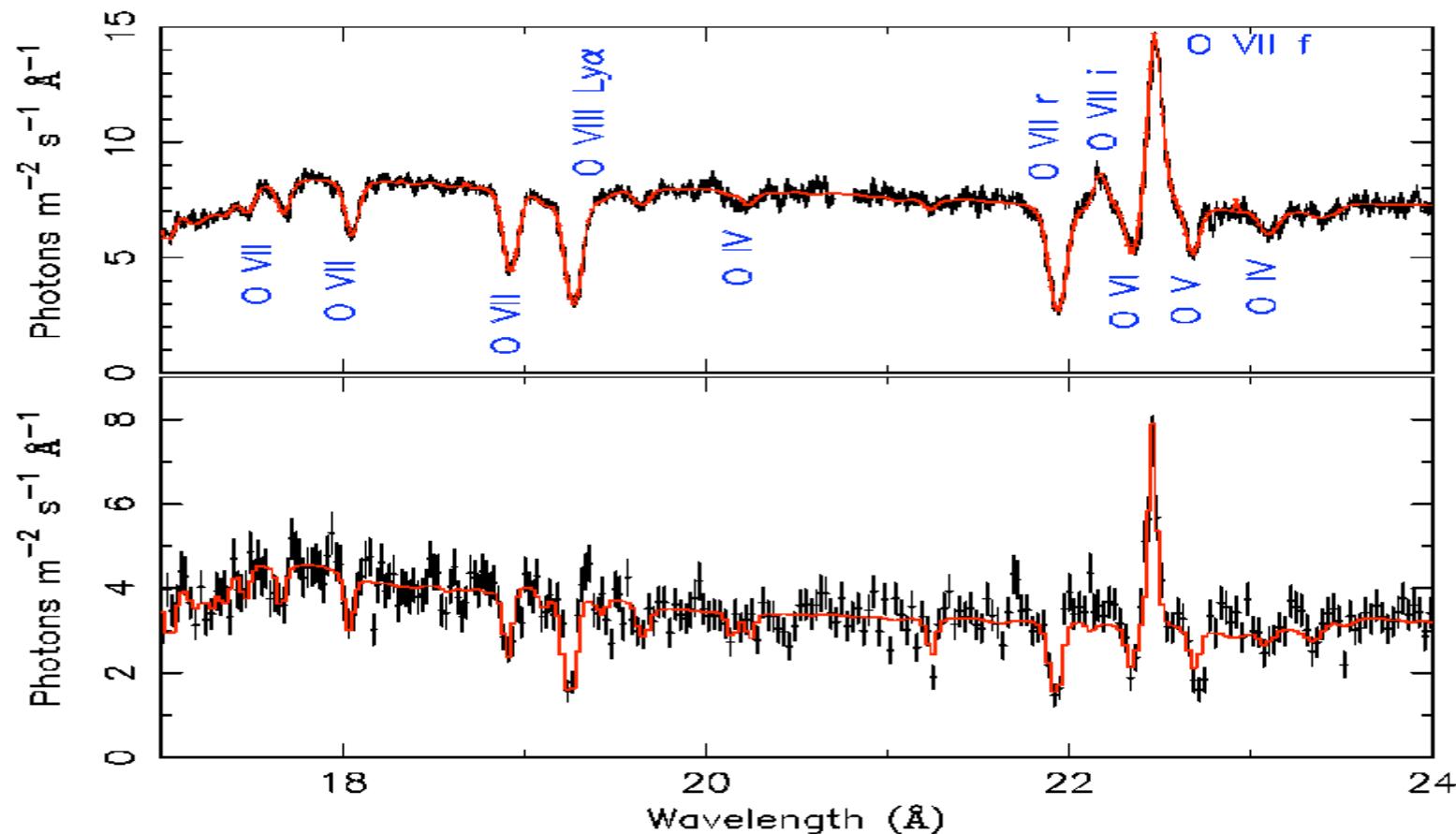
$$\log \xi = 0.5,$$

$$\log \xi = 1.9,$$

$$\log \xi = 2.9$$

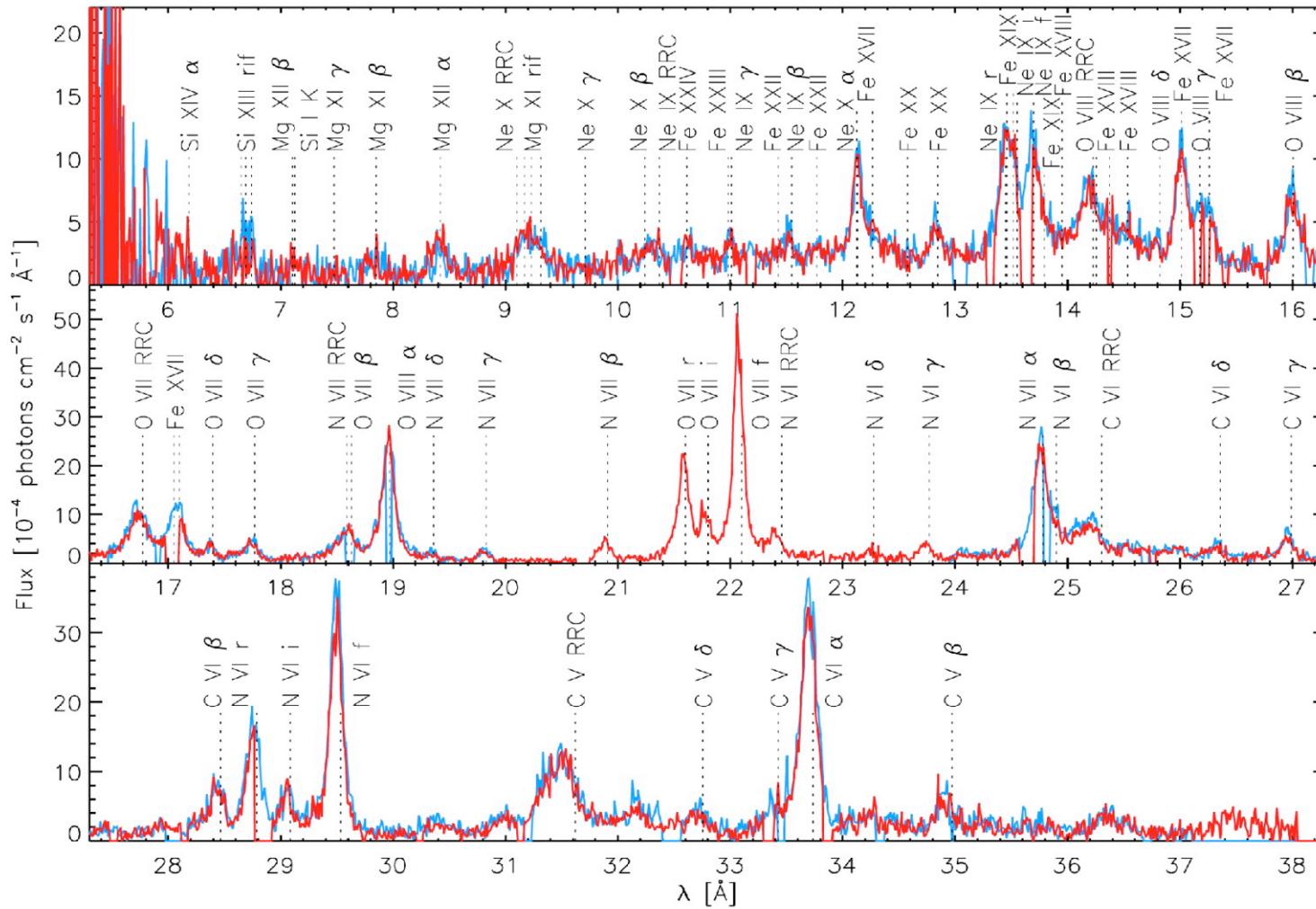
Inner shell absorption lines

- First innershell lines: Fe UTA in IRAS 13349+2438 (RGS, Sako et al. 2001)
- Oxygen lines: NGC 5548 (RGS, LETGS, Steenbrugge et al. 2003)
- Mg, Si etc: NGC 3783 (HETGS, Kaspi et al. 2002; Behar & Netzer 2002)



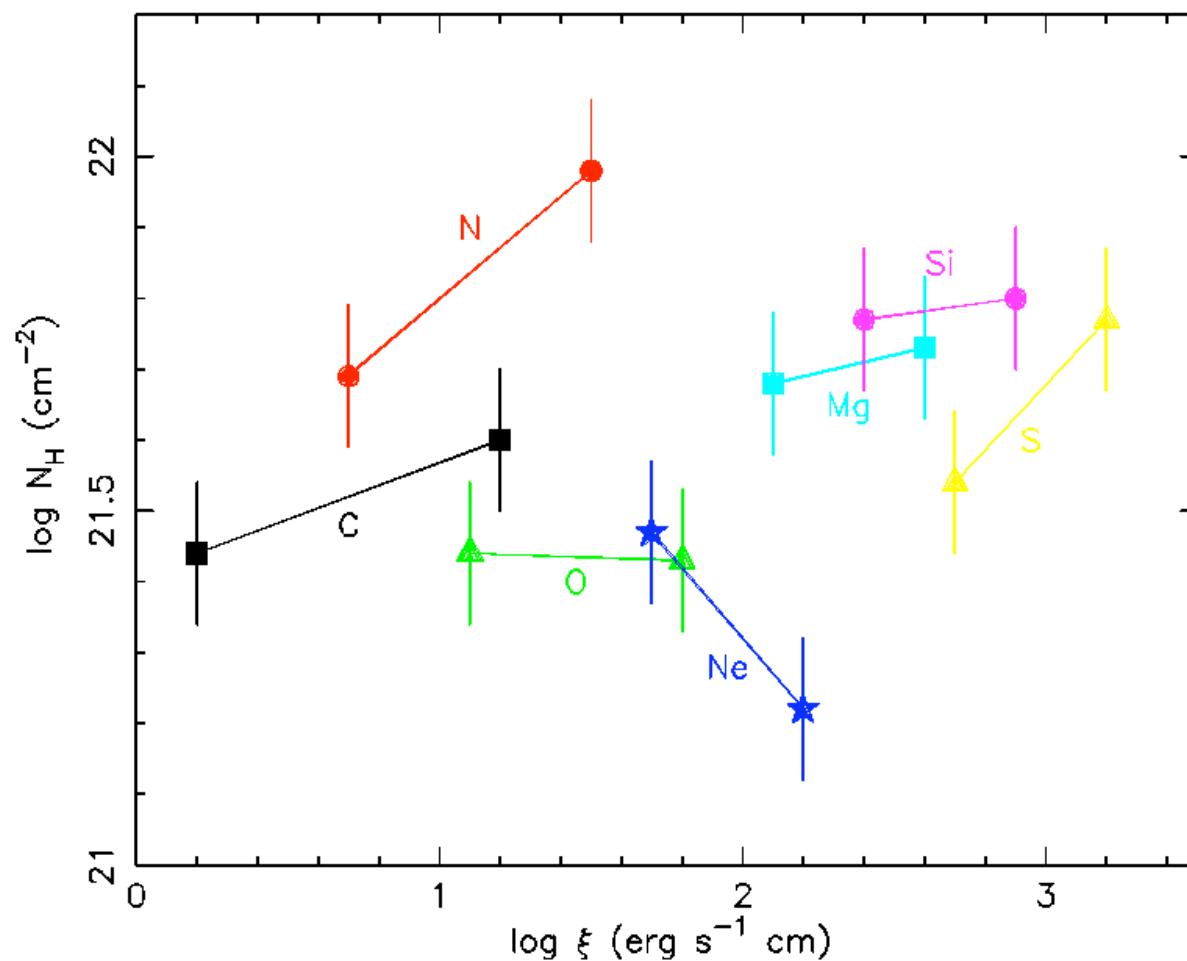
AGN Unification: NGC 1068

- XMM-Newton RGS spectra: Kinkhabwala et al. 2002
- Strong Radiative Recombination continua, kT few eV
- Emission line spectrum dominated by H/He-like ions
- Emission lines show blueshifts up to 600 km/s



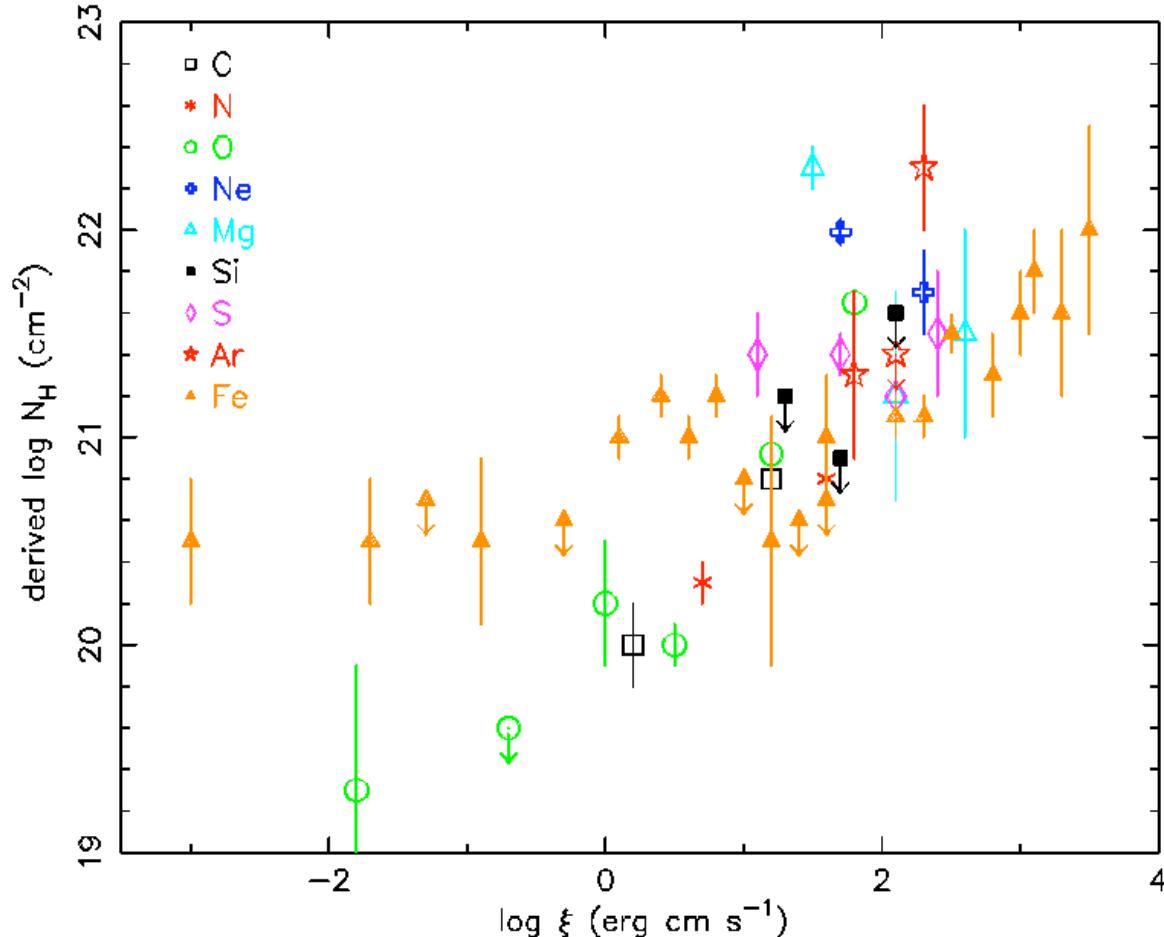
Column density versus ionization

- Seyfert 2 galaxies
- use the emission lines
- NGC 1068 column densities from H/He-like ions
- (Brinkman et al. 2002, LETGS)



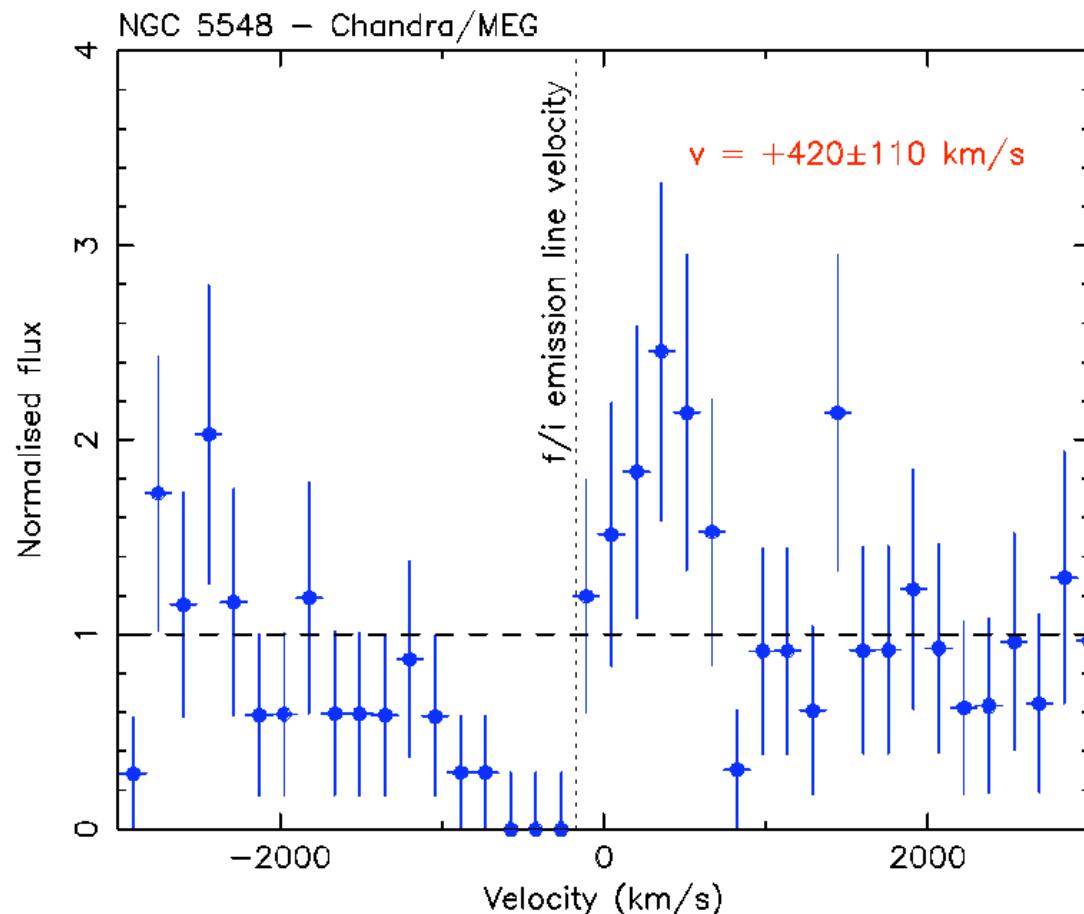
Column density versus ionization

- Seyfert 1 galaxies:
 - use the absorption lines
 - NGC 5548 column densities from several ions
 - (Steenbrugge et al. 2003, RGS)



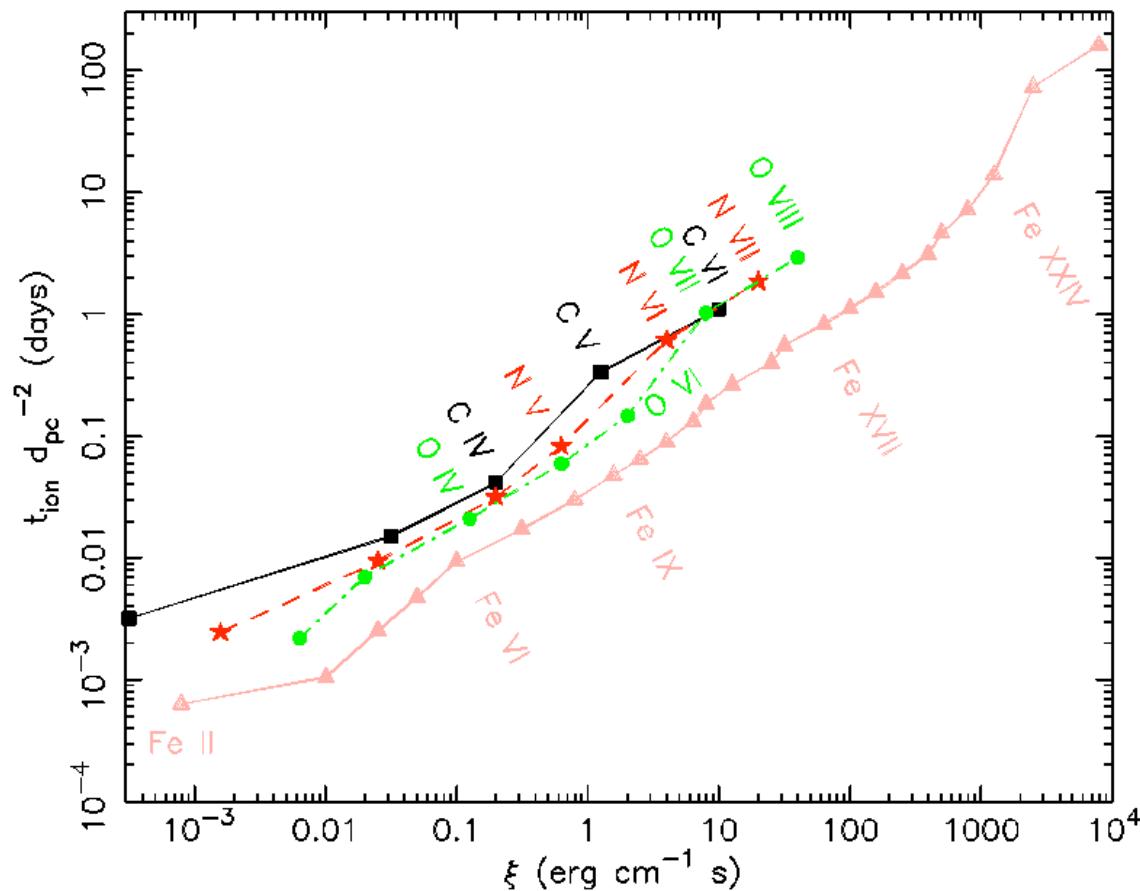
P Cygni profiles?

- Some strong resonance absorption lines have redshifted emission components
- Example: NGC 5548 Chandra MEG (Kaastra et al. 2002)
- Show time variability
- If truly P cygni \Rightarrow geometry of the outflow
- Relation to forbidden emission lines ??



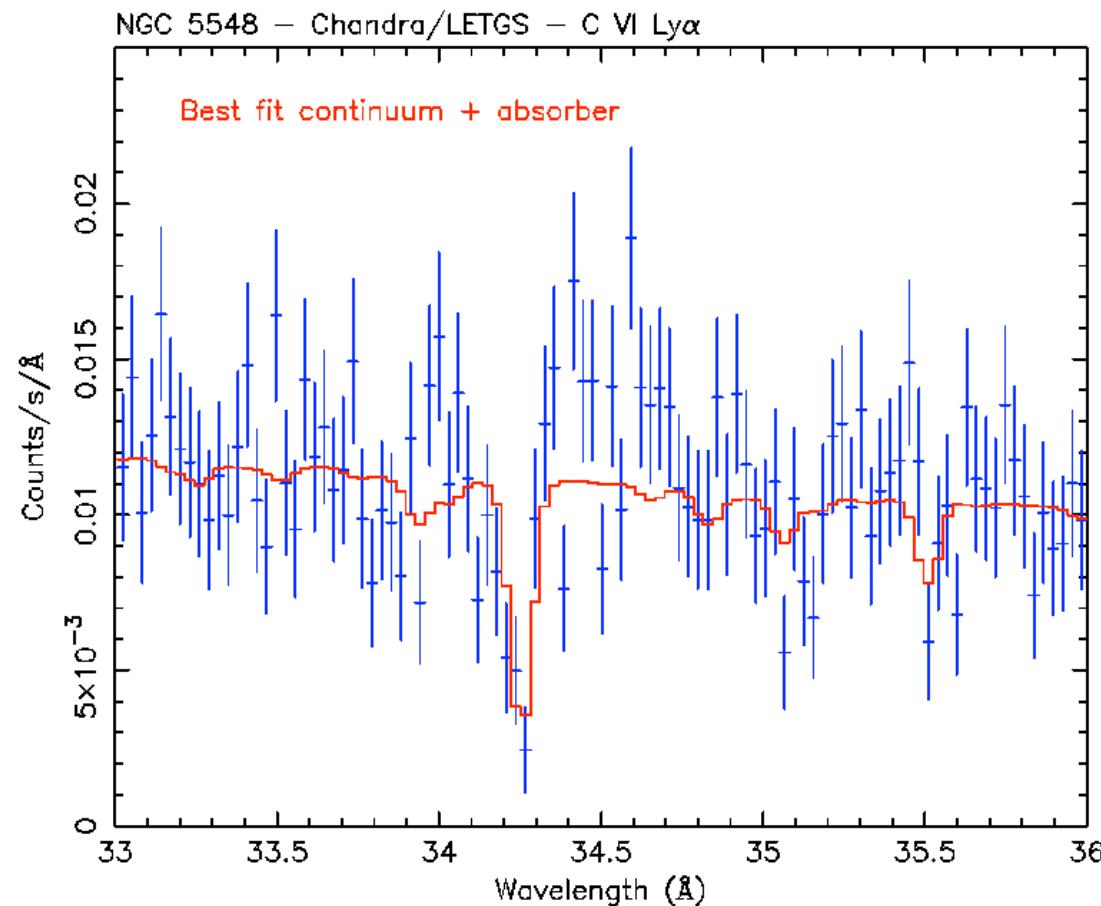
Timing & Reverberation

- Different ions have quite different ionization time scales
- Also important: continuum variation basic time scale
- Also important: light travel time through a cloud
- Reverberation \Rightarrow spatial structure



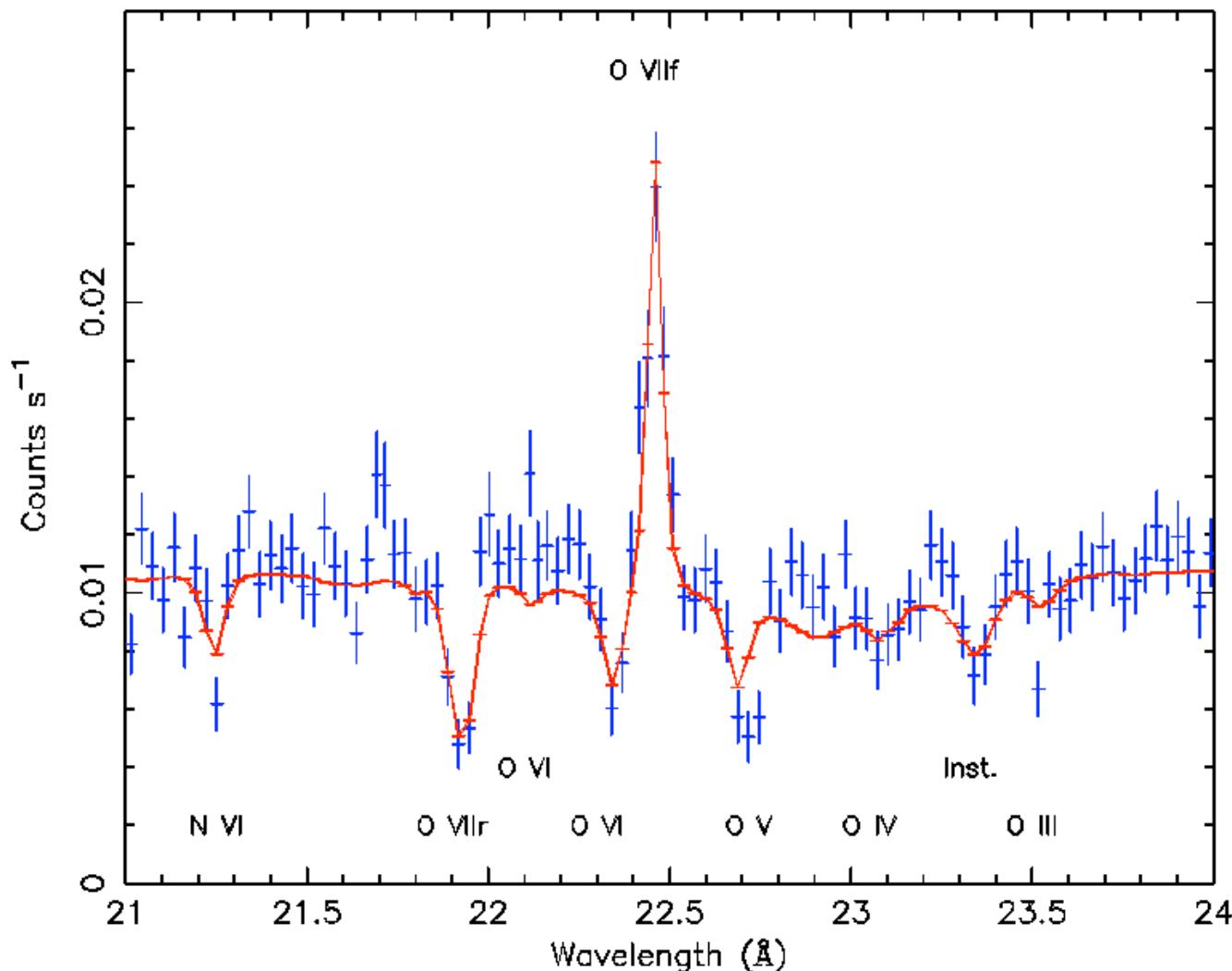
Broad emission lines

- C VI Ly α has broad emission component in NGC 5548
(LETGS, Kaastra et al. 2002)
- FWHM 10000 km/s
- amplitude about 20 %
- affects analysis of absorption lines



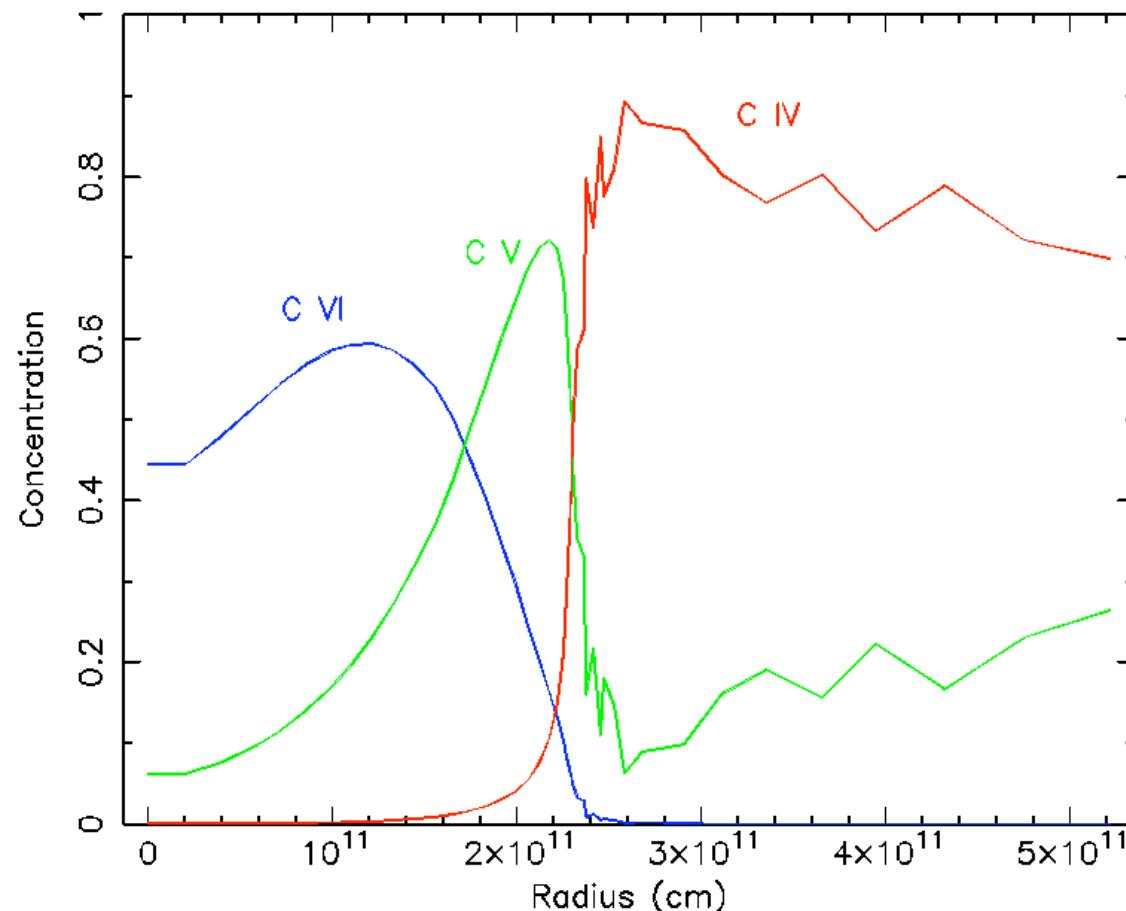
More broad emission lines

- Around the O VII triplet in NGC 5548
- (Chandra LETGS 340 ks, Steenbrugge et al., see poster!)



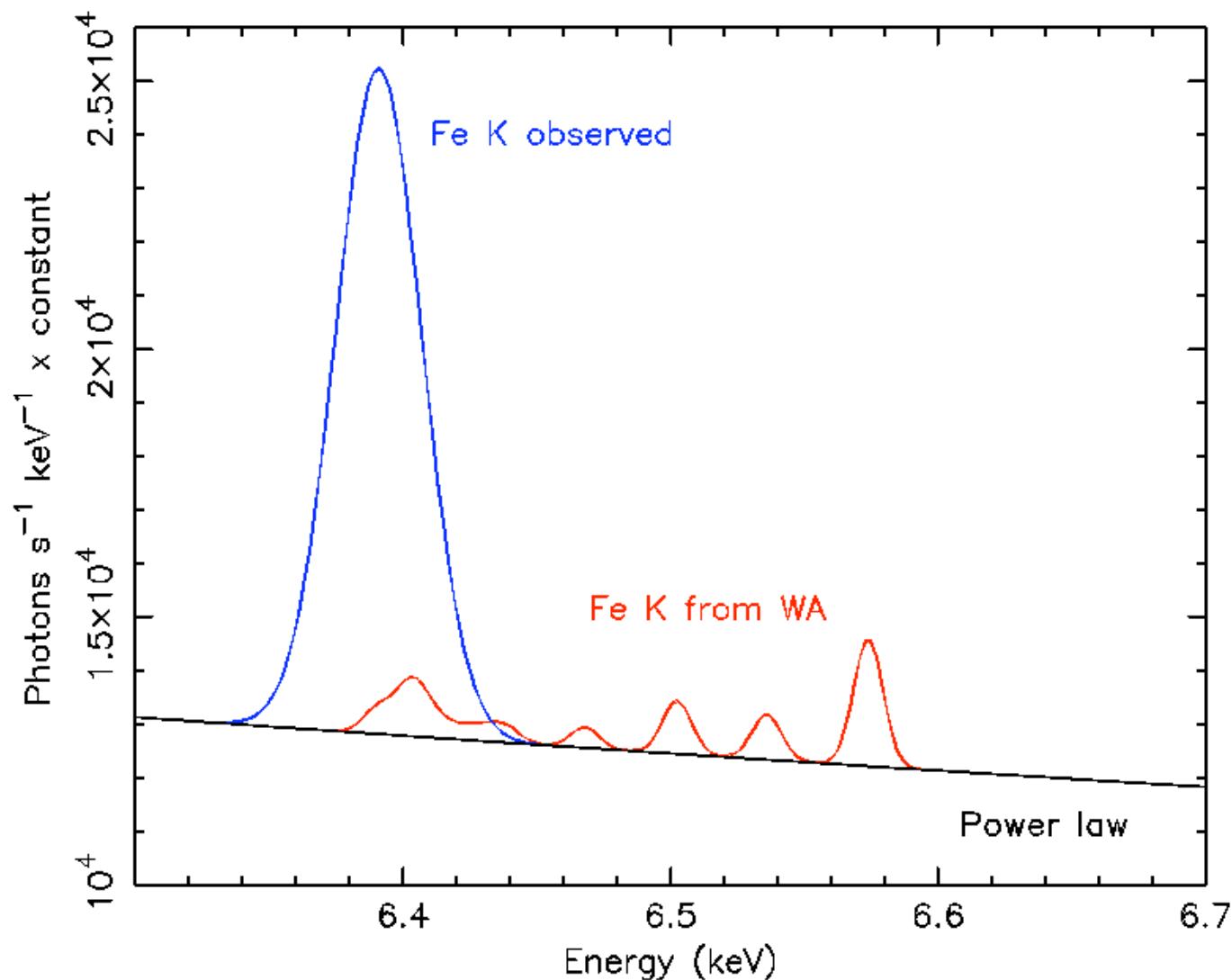
Dynamics of broad lines

- XSTAR model for NGC 5548 continuum
- BLR parameters from Goad & Koratkar:
 - density $10^{11.3} \text{ cm}^{-3}$
 - $\log U = -0.3$ ($\log \xi = 1.3$)
 - $N_H = 10^{23} \text{ cm}^{-2}$

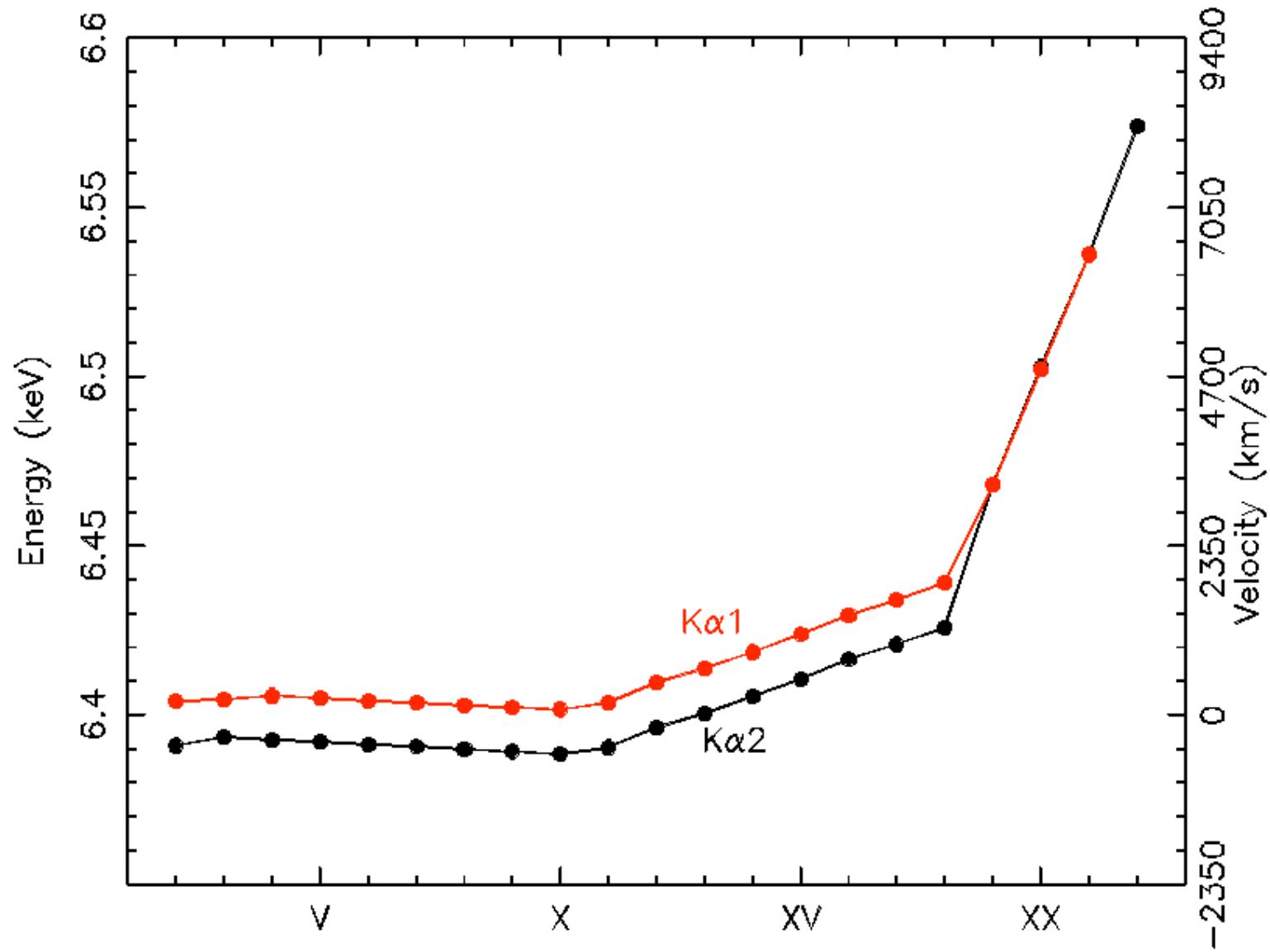


Fe-K from the warm absorber?

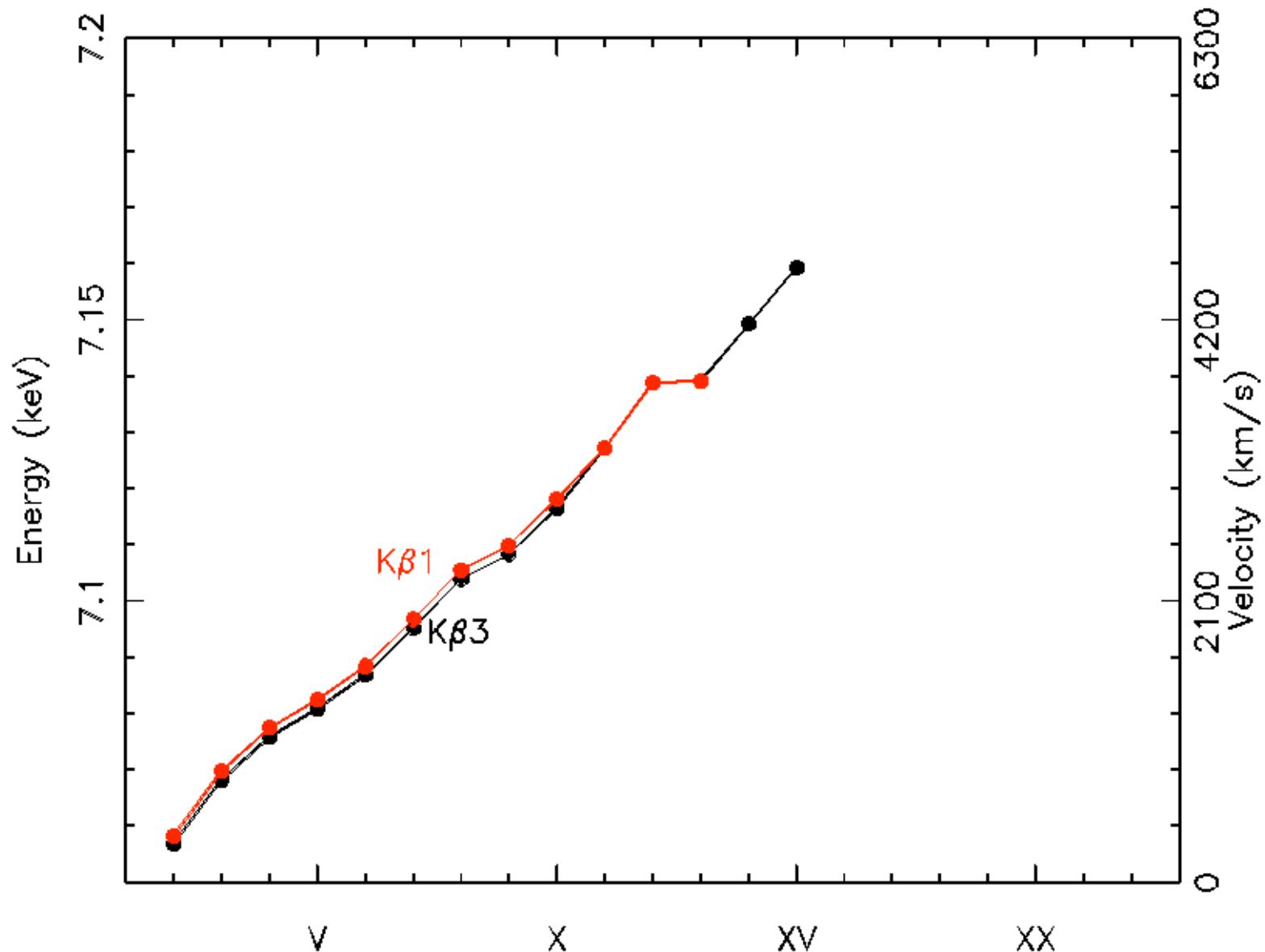
- Simulated Fe-K data for $\Omega = 4\pi$ warm wind



Iron K α diagnostics



Iron K β diagnostics



Conclusions

- Expected benefits from Con-X:
- Higher sensitivity \Rightarrow weaker sources \Rightarrow larger samples
- Higher sensitivity \Rightarrow reverberation possible in brighter sources
- Higher sensitivity \Rightarrow possible to use important weaker diagnostic lines
- Higher spectral resolution at high E: \Rightarrow Fe-K diagnostics
- and finally, new unexpected breakthroughs (?!)